SHERATON UNIVERSAL CITY AMBIENT VIBRATION TESTS

On December 18th, 1997 ambient vibration measurements were made on the Sheraton Hotel at Universal City in North Hollywood, California by Professor Gerry Pardoen, Univ. of California, Irvine; Erik Straser a Ph.D. student at Stanford University; and Chuck Farrar from Los Alamos National Laboratory. The hotel is a twenty-one story ductile moment-resisting concrete frame structure that has permanent instrumentation installed as part of the California Strong Motion Instrumentation Program. This program is administered by the State of California's Division of Mines and Geology. A photo of the structure is shown in Fig. 1.

Fig. 1 Sheraton Hotel at Universal City, North Hollywood, California

Thirteen Kinemetrics accelerometers are permanently located throughout the building as shown in Fig. 2. Data from these accelerometers were sampled and processed with a Hewlett-Packard (HP) 3566A dynamic data acquisition system. This system includes a model 35650 mainframe, 35653A source module used to drive a shaker (not used during this test), 5 35653A 8-channel input modules which performed the analog to digital conversion of accelerometer signals, and a 35651C signal processing module that performed the needed Fast Fourier Transform calculations. A Toshiba Tecra 700CT Laptop was used for data storage and as a platform for the HP software that controls the data acquisition system.

Various signal sampling parameters were specified during the different measurements. These parameters are summarized in Table I. Unit calibration factors were specified for each accelerometer. Excitation was caused by background vibration sources such as wind, traffic, and mechanical equipment in the structure.

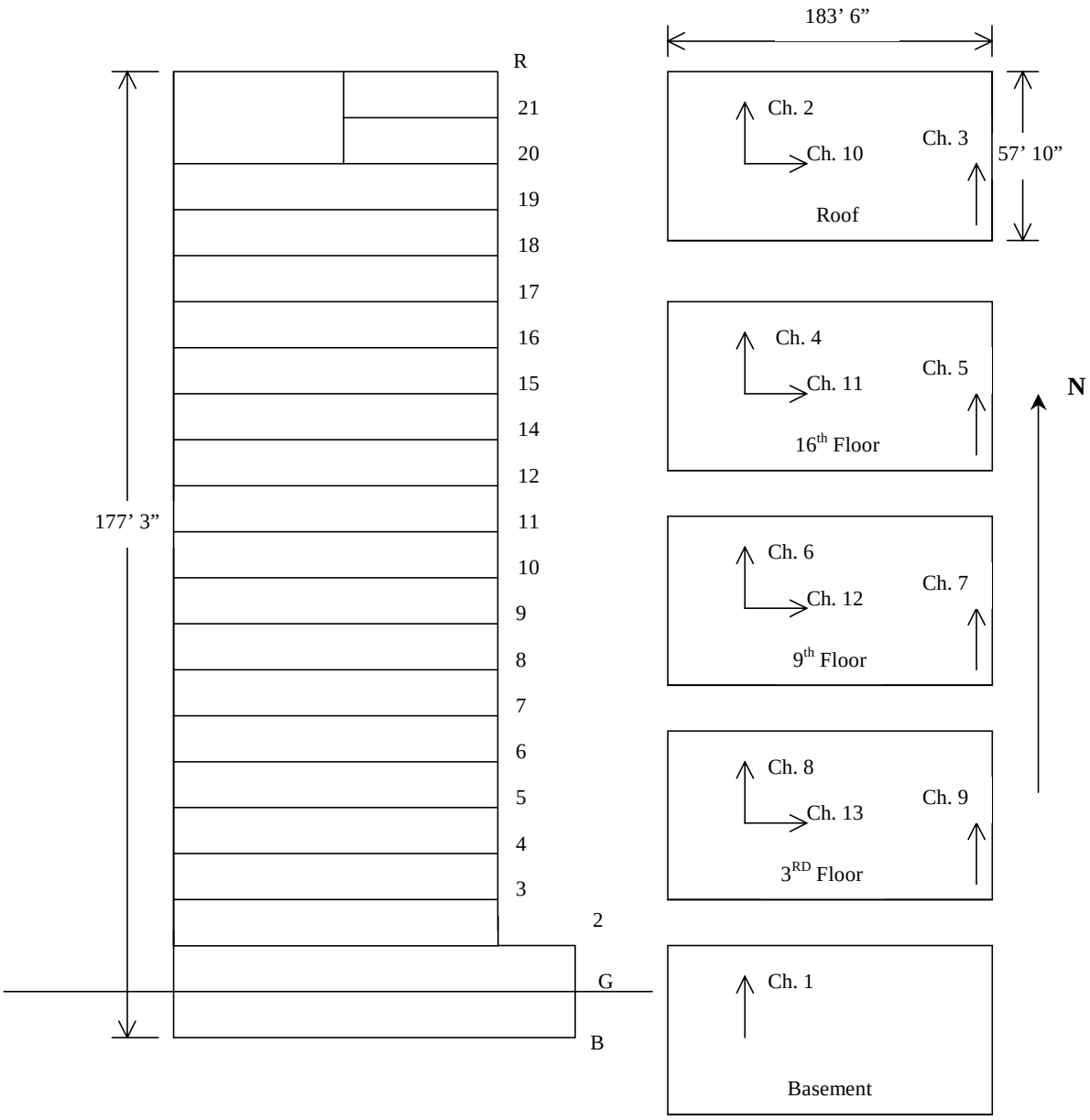

Fig. 2 Strong motion instrumentation locations.

When Hanning windows were applied to the time histories, the primary function of interest that was measured was the cross-power spectra between a designated reference accelerometer and the other accelerometers. The relative amplitude and phase information provided by the cross-power spectra allows the resonant frequencies and mode shapes of the structure to be determined to the degree that this spatial array of measurements will allow. In addition to the cross-power spectra, the power spectra for all accelerometers were calculated along with the frequency response functions, and the coherence functions. The time history from the last average is also stored with these data. When uniform windows were specified, longer duration time histories were being recorded for future analysis. Additionally, single-average spectral quantities are calculated and stored with these data.

A second set of measurements was made with Kinemetrics Ranger Seismometers provided by Prof. Pardoen. These instruments measure velocity and displacement. The locations of these instruments are summarized in Table II. Calibration factors were not applied .

TABLE I
Sampling Parameter Used During Ambient Vibration Measurements

Test Designation	Frequency Range	Number of Averages	Record Length	Number of samples	Frequency Resolution	Window
SH158 Ref.=Ch. 2.	0-12.5 Hz	30	64 s	2048	0.015625 HZ	Hanning
SH258 Ref.=Ch. 3.	0-12.5 Hz	30	64 s	2048	0.015625 HZ	Hanning
SH358 Ref.=Ch. 2.	0-6.25 Hz	10	256 s	4096	0.00390625 HZ	Hanning
SH458 Ref.=Ch. 3.	0-6.25 Hz	10	256 s	4096	0.00390625 HZ	Hanning
SH558 Ref.=Ch. 2.	0-6.25 Hz	1	512 s	8192	0.001953125 HZ	Uniform
SH658 Ref.=Ch. 2.	0-6.25 Hz	1	512 s	8192	0.001953125 Hz	Uniform
SH758 Ref.=Ch. 2.	0-25 Hz	20	32 s	2048	0.03125 Hz	Hanning
SH858 Ref.=Ch. 2.	0-25 Hz	20	32 s	2048	0.03125 Hz	Hanning
SH958 Ref.=Ch. 2.	0-25 Hz	1	128 s	8192	0.0078125 Hz	Uniform
SH1058 Ref.=Ch. 2.	0-25 Hz	1	128 s	8192	0.0078125 Hz	Uniform

TABLE II
Location of Kinemetrics Ranger Displacment and Velocity Transducers

Channel	Floor	Measurement Direction	Measurement Quanitity
1	20.5	south	Displacement
2	20.5	south	Velocity
3	20.5	east	Displacement
4	20.5	east	Velocity
5	14.5	south	Displacement
6	14.5	south	Velocity
7	14.5	east	Displacement
8	14.5	east	Velocity
9*	8.5	south	Displacement
10*	8.5	south	Velocity

* Channels 9 and 10 were realigned in the east direction for test SH858 and SH958